

## CLAIMS

What is claimed is:

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1. A dental composition comprising  
a curable blend of one or more polythiol compounds and one or more  
polyvinyl compounds, wherein  
said polythiol compounds are polythiol oligomers.

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2. The dental composition of claim 1 wherein  
said polythiol oligomers are formed by prepolymerization of first polyvinyl  
monomers in the presence of an excess of first polythiol monomers.

3. The dental composition of claim 1, wherein

15 said polyvinyl compounds are polyvinyl oligomers.

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The dental composition of claim 3, wherein  
said polyvinyl oligomers are formed by prepolymerization of second  
polythiol monomers in the presence of an excess of second polyvinyl  
monomers.

5. The dental composition of claim 1 further comprising at least one filler.

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6. The dental composition of claim 5 further comprising at least one photoinitiator.

7. The dental composition of claim 6 wherein said at least one photoinitiator is  
selected from the group consisting of camphorquinone, ethyl 4-  
dimethylaminobenzoate, and 2,2-dimethoxy-2-phenylacetophenone.

8. The composition of claim 1 wherein said first polythiol monomers are chosen

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from the group consisting of trimethylolpropane tris(3-mercaptopropionate), and  
pentaerythritol tetrakis(3-mercaptopropionate).

9. The composition of claim 1 wherein said first polyvinyl monomers are selected  
from the group consisting of trimethylolpropane trivinyl ether, pentaerythritol  
triallyl ether, and 1,3,5-triallyl-1,3,5-triazine-2,4,6-trione.

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10. The dental composition of claim 4 wherein the first polyvinyl monomer and the  
second polyvinyl monomer are different monomers.

11. The dental composition of claim 4 wherein the first polythiol monomer and the  
second polythiol monomer are different monomers.

12. The dental composition of claim 2 wherein the first polyvinyl monomer and the  
35 polyvinyl compound are different.

13. The dental composition of claim 2 wherein the first polythiol monomer is formed by the method comprising:
  - reacting a diisocyanate with an excess of an alcohol monomer to obtain a polyalcohol monomer;
  - 5 converting one or more hydroxy groups on said polyalcohol monomer to thiol functional groups to obtain the polythiol monomer.
14. The dental composition of claim 2 wherein the polythiol monomer is formed by the method comprising:
  - reacting a diisocyanate with an excess of an alcohol monomer, wherein said alcohol monomer has at least one thiol functional group, to form the polythiol monomer.
15. The dental composition of claim 2 wherein the polyvinyl monomer is formed by the method comprising:
  - reacting a diisocyanate; in an excess of an alcohol monomer to form polyalcohol monomers having hydroxy functional groups;
  - 10 reacting the polyalcohol monomers with vinyl acetate to form the polyvinyl monomers.
16. A dental composition comprising a curable blend of one or more polythiol compounds and one or more polyvinyl compounds, wherein
  - 20 at least one of said polyvinyl compounds are polyvinyl oligomers.
17. The dental composition of claim 16, wherein
  - said polyvinyl oligomers are formed by prepolymerization of polythiol monomers in the presence of an excess of polyvinyl monomers.
18. The dental composition of claim 16 further comprising at least one filler.
- 25 19. The dental composition of claim 18 further comprising at least one photoinitiator.
20. The dental composition according to claim 19 wherein said at least one photoinitiator is selected from the group consisting of camphorquinone, ethyl 4-dimethylaminobenzoate, and 2,2-dimethoxy-2-phenylacetophenone.
- 30 21. The composition of claim 17 wherein said polythiol monomers are chosen from the group consisting of trimethylolpropane tris(3-mercaptopropionate), and pentaerythritol tetrakis(3-mercaptopropionate).

22. The composition of claim 17 wherein said polyvinyl monomers are chosen from the group consisting of trimethylolpropane trivinyl ether, pentaerythritol triallyl ether, and 1,3,5-triallyl-1,3,5-triazine-2,4,6-trione.
23. The composition of claim 17 wherein the polythiol compound and the polythiol monomer are different.  
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24. A method of preparing a dental composition comprising the steps:
  - a. polymerizing first polyvinyl monomers in presence of an excess of first polythiol monomers to obtain polythiol oligomers;
  - b. polymerizing second polythiol monomers in presence of an excess of second polyvinyl monomers having vinyl functional groups to obtain polyvinyl oligomers; and  
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  - c. stoichiometrically mixing the polythiol oligomers and the polyvinyl oligomers to obtain a first mixture.
25. The method of claim 24 further comprising:  
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- d. polymerizing the first mixture.
26. The method of claim 24 further comprising:
  - d. mixing the first mixture with at least one filler having color and at least one photoinitiator to obtain a second mixture.
27. The method of claim 26 further comprising:  
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- e. packaging the second mixture in a container based on a color of the filler.
28. The method of claim 27 further comprising:
  - f. dispensing at least a portion of the second mixture from the container;
  - g. shaping the dispensed portion of the second mixture into a dental prosthesis; and  
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  - h. photopolymerizing the second mixture.
29. The method of claim 17 further comprising:
  - reacting a diisocyanate in an excess of an alcohol monomer to form polyalcohol monomers having hydroxy functional groups;
  - reacting the polyalcohol monomers with vinyl ethers to form the polyvinyl monomers of step (a); and  
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  - reacting the diisocyanate with an excess of an alcohol monomer, wherein said alcohol monomer has at least one thiol functional group, to form the polythiol monomers of step (a).
30. A method of preparing a shaped dental prosthetic device comprising the steps:

- a. dispensing a mixture of one or more polythiol compounds and one or more polyvinyl compounds, wherein said polythiol compounds are polythiol oligomers formed by prepolymerization of first polyvinyl monomers in the presence of an excess of first polythiol monomers;
- 5 b. shaping the mixture into a dental prosthesis; and
- c. polymerizing the mixture.

31. The method of claim 30 further comprising:

reacting a diisocyanate in an excess of an alcohol monomer to form polyalcohol monomers having hydroxy functional groups;

10 reacting polyalcohol monomers with vinyl ethers to form the polyvinyl monomers; and

reacting the diisocyanate with an excess of an alcohol monomers, wherein said alcohol monomer has at least one thiol functional group, to form the polythiol monomers.

15 32. The method of claim 30 wherein the mixture further comprises a filler and the method further comprises: selecting the mixture based on filler color.

33. The method of claim 32 wherein the mixture includes at least one photoinitiator and polymerizing further comprises:

photopolymerizing the mixture by exposing it to a light source operable to cause the photoinitiator to initiate the polymerization reaction.

20 34. The method of claim 30, wherein

said polyvinyl compounds of step (a) are polyvinyl oligomers formed by prepolymerization of second polythiol monomers in the presence of an excess of second polyvinyl monomers.

25 35. The method according to claim 33 wherein said at least one photoinitiator is selected from the group consisting of camphorquinone, ethyl 4-dimethylaminobenzoate, and 2,2-dimethoxy-2-phenylacetophenone.

36. The method of claim 30 wherein said first polythiol monomers are chosen from the group consisting of trimethylolpropane tris(3-mercaptopropionate), and

30 pentaerythritol tetrakis(3-mercaptopropionate).

37. The method of claim 30 wherein said first polyvinyl monomers are chosen from the group consisting of trimethylolpropane trivinyl ether, pentaerythritol triallyl ether, and 1,3,5-triallyl-1,3,5-triazine-2,4,6-trione.

38. The method of claim 34 wherein the first polyvinyl monomer and the second polyvinyl monomer are different monomers.
39. The method of claim 34 wherein the first polythiol monomer and the second polythiol monomer are different monomers.
- 5 40. The method of claim 30 wherein the first polyvinyl monomer and the polyvinyl compound are different.